Article

Gender and regional differentials in health expectancy in Greece

Christos Bagavos
Department of Social Policy, Panteion University, Athens, Greece

Significance for public health

Health expectancy differentials challenge the debate about health policies aiming at reducing heath inequalities among individuals. The paper suggests that health status discrepancies measured by healthy life years' indicator are pronounced among regions and between genders. Our findings have implications for several issues related to public health policies and, in particular, those referring to prevention, the universal access to health services as well as the quality of the provision of health care services. Monitoring both the health status of the population and the undesired differentials in health expectancy should help to avoid an expansion of morbidity and to reduce the unequal distribution of population's health status.

Abstract

Background. Differentials and inequalities in heath status are closely related to the implementation and the sustainability of public health policies. The paper investigates differences in health expectancy as an indicator of population health among regions and between genders.

Design and Methods. Based on activity limitation, we compute Healthy Life Years indicator by applying the prevalence-based Sullivan method. The analysis is based on data from the National Health Survey conducted in Greece in 2009 by the Hellenic Statistical Authority, carried out on a multistage probability sample of 6172 individuals.

Results. The results show that men are more likely than women to live a greater part of their life in good health. When regions are considered (NUTS_1 and NUTS_2 levels), the resulting diversities in healthy life years are more pronounced than those in life expectancy.

Conclusions. The paper provides additional insights about health status discrepancies among Greek geographic regions and between genders. The results indicate that men are more likely to report to be in good health than women, and the differences by gender are more pronounced at regional than at national level. This empirical evidence can be used for monitoring both, the population health status and the undesired differentials in health expectancy, and may therefore be a useful tool for health policies aiming at reducing heath inequalities among individuals.

Introduction

Regional variations in life expectancy in Greece have already been described in the beginning of the post-war period. However, the pattern of the differences has changed over time. Life expectancy continues to grow along with a gradual decrease of regional inequalities.[1] In particular, the comparison between maximum and minimum values of life expectancy at birth indicates that, over the last twenty years, the difference for males has dropped from 2.8% to 1.3% at NUTS_1 and from 4.6% to 4.2% at NUTS_2 levels. A similar pattern is observed for females *i.e.* a decrease from 2.0% to 1.5% and from 5.3% to 4.9% respectively. At the same time, sex differentials in life expectancy have been reduced from 6.5% to 6.3% at national level and from 9.1% to 7.8% and from 11.6% to 11.3% at NUTS_1 and NUTS-2 levels respectively.

Recently, there has been a political interest in regional variations in health. In order to achieve greater efficiency health reforms have been introduced aiming at the regionalization and decentralization of services. However, the debate is oriented mainly towards discrepancies in health care expenditures rather than in the health status of the population. The question remains as to whether regional and gender variations in health status diverge in a similar way as does life expectancy.

To answer this question we use the concept of health expectancy. Health expectancies are important indicators for monitoring the health of a population as well as for addressing the debate about compression or expansion of morbidity in a context of increasing life expectancy.[2] By reflecting people's health status, these indicators contribute to the discussion on the quality of life as well as on the future costs of health care and social welfare systems. Very often health expectancies, by revealing large socio-economic and gender inequalities, highlight policy issues. For instance, the large inequalities for both males and females in the chances of remaining healthy after retirement challenge the policy expectation of an overall increase in social participation at older ages.[3]

The importance of health expectancy indicators has led to a growing number of studies for various countries,[4] as well as of papers focusing on methodological issues.[2,5-11] It is also important to note the increasing number of international research networks in the field of health expectancies, namely REVES (Réseau Espérance de Vie En Santé, http://reves.site.ined.fr/en/home/) and EHLEIS [(European Health and Life Expectancy Information System, http://www.eurohex.eu/, the follow-up of EHEMU (European Health Expectancy Monitoring Unit, http://www.eurohex.eu/)] as well as the availability of health expectancy indicators in official databases.[12]

However, studies focusing on Greece are rather scarce,[13] since for the most part, Greece is presented in a cross-national context,[14-16] and very often in reports of international research networks.[17] The present study aims to help close this gap, by investigating the degree of regional and gender differentials in health expectancy, an aspect which has not been addressed in empirical analyses by previous studies. The paper also examines to what extent those inequalities are of the same magnitude as differences in life expectancy.

Design and Methods

Our analysis deals with health expectancy in Greece. Health expectancy is a composite health indicator, combining information on life expectancy with prevalence of ill health.[5-6,18,19] It focuses on the quality of life spent in a healthy state, rather than the quantity of life as measured by life expectancy. Health expectancy can be measured by

using a variety of different health dimensions. But mainly three methods are used to calculate that measure.[20] The first is based on the general self-perceived or self-rated health (very good, good, fair, bad, very bad), the second on chronic health problems (yes, no) and the third on the global activity limitation indicator (strongly limited, limited, not limited). In this paper, the analysis is based on the global activity limitation *i.e*. the person's self-assessment of whether they are hampered in their daily activity by any on-going physical or mental health problem, illness or disability.[20] Moreover, the terminology used for health expectancy indicator is Healthy Life Years (HLY). This indicator measures the number of remaining years that a person of specific age is expected to live without any severe or moderate health problem.

In order to compute a health expectancy indicator the following information is required: the age-specific prevalence (proportions) of the population in healthy and unhealthy state and age-specific mortality information taken from a period life table. As a specific health expectancy indicator, the healthy life years indicator is based on a self-perceived question which aims to measure the extent of any limitations because of a health problem that may have affected respondents as regards activities they usually do.

Data on perceived activity limitation were provided by the National Health Survey, conducted in Greece in 2009 by the Hellenic Statistical Authority.[21] Based on the methodology used for Eurostat's European Health Interview Survey, it provides information on perceived health of a sample of 6172 individuals (2412 men and 3760 women), aged 15 years and over, and selected by multistage sampling. According to the data, the average age of the overall survey population is 53.0 years and that of female and male populations are 54.3 and 51.0 years respectively. People between ages 15 and 39 account for the 28.6% of the total survey population, those aged 40-64 for the 38.6% and the remaining 32.8% are those aged 65 years or over. The corresponding figures for women are 26.0%, 39.2% and 34.8% whereas for men they are 32.6%, 37.6% and 29.8%.

The data used for this study relates to responses to the question: For at least the past 6 months, to what extent have you been limited because of a health problem in activities people usually do? Would you say you have been severely limited/limited but not severely/not limited at all?. At national level, this question has a very high response rate relating in a very small number of missing values (3 males and 4 females). As far as regional level is concerned, the response rate is also very high, the lowest level (99.1%) is observed for male population living in the Peloponnese (GR25). Individuals responding *severely limited* or *limited but not severely* are regarded as being in ill health. In other words, *unhealthy* condition is defined by the limitation in activities people usually do because of health problems at least for the last 6 months. Those responding *not limited at all* are defined as being in good health (*healthy* condition). On the basis of these responses, prevalence is calculated as the proportion of a population that has a characteristic or condition at a specific point in time. To adjust for the design characteristics of the survey, weighted prevalence rates are applied. By using the Sullivan method, prevalence rates are combined with mortality data in order to estimate the healthy life years indicator.[7,22] This method allows determining the number of years and the proportion of life lived in three different health status (with severe activity limitation, with restricted activity limitation and without any activity limitation). It is based on the current health state of the population using present age specific rates for both mortality and disability-activity limitation. On the basis of the number of deaths and the average population by age and sex in 2009, provided by the Hellenic Statistical Authority, the age and gender specific period life tables are computed for the various regions in Greece for the year 2009. In order to avoid under/over estimation of mortality levels, caused by the small number of deaths by age in certain regions, abridged life tables are computed for the typical set of age groups (0 to less than 1 years, 1 to 4 years, 5 to 9 years etc.). The final age group is 85 years or higher. This is appropriate for the Sullivan method since the estimation of the healthy life years indicator is not very sensitive to the size of the age groups.[22] Since the survey population is defined as aged 15 years and over, additional assumptions are required for calculating prevalence rates for those below 15 years. In line with Eurostat methodology, the prevalence rates for the age groups 1-4, 5-9 and 10-14 years are assumed to be the half of that estimated for the age group 15-19 years. In addition, we also assume that the prevalence of ill health at birth is equal to 0.

The total number of years lived from a specific five-year age group onwards to the final age as well as life expectancy within each five-year age group was calculated by standard life table methods. The prevalence rates were used to calculate the total number of years lived in a specific health state for the age intervals of the population in the life tables. Healthy life year values were obtained by dividing total healthy years at each age group by the size of the life table cohort at that age group. Abridged life tables and abridged health expectancy tables are computed at national (GR-Greece) and regional level, for both sexes and separately for males and females. The standard regional classification NUTS_1 includes the following regions: Northern Greece (GR1); Central Greece (GR2); Attica (GR3); Aegean Islands and Crete (GR4). The more detailed classification NUTS_2 includes: Eastern Macedonia and Thrace (GR11); Central Macedonia (GR12); Western Macedonia (GR13); Thessaly (GR14); Epirus (GR21); Ionian Islands (GR22); Western Greece (GR23); Central (Sterea) Greece (GR24); Peloponnese (GR25); Northern Aegean (GR41); Southern Aegean (GR42); Crete (GR43).

Table 1. Activity limitation by sex, Greece, 2009.

	Raw data						Prevalence (%)		
	Unweighted			Weighted			Weighted		
	Total	Males	Females	Total	Males	Females	Total	Males	Females
Severely limited	779	236	543	82,6615	338,248	48,8367	8.9	7.5	10.3
Limited but not severely	1086	302	784	1,289,933	476,591	813,342	13.9	10.5	17.1
Not limited at all	4300	1871	2429	7,185,477	372,3355	3,462,122	77.2	82.0	72.6
Total	6165	2409	3756	9,302,025	4,538,194	4,763,831			
Don't know	4	1	3	2150	270	1880			
Refusal	3	2	1	1759	1300	459			
Total	6172	2412	3760	9,305,934	4,539,764	4,766,170			

Source: calculations based on the 2009 National Health Survey, Hellenic Statistical Authority (EL.STAT).

Results

At national level, the proportion of people without any activity limitation was 77.2% (Table 1). It clearly differs by sex, since it was 82.0% for men and 72.6% for women. Prevalence rates without any activity limitation also differ by region (Table 2). At NUTS_1 level, it ranges from 74.6% (Northern Greece) to 80.5% (Attica) and at NUTS_2 level from 68.4% (Western Greece) to 85.0% (Ionian Islands). The corresponding figures (NUTS_1 or NUTS_2 level) for men are 67.4% (Epirus) and 88.0% (Thessaly) and for women 64.0% (Northern Greece) and 81.3% (Peloponnese).

Life expectancy at birth, expected number of years lived with severe, limited and not limited at all activity limitation as well as proportion of the life-time spent in those three health status for both sexes are presented in Table 3. In 2009, children born in Greece were expected to live in total 80.2 years: 7.0 years with strong disability, 10.0 years with disability and 63.2 years without disability. In fact, they are expected to live around the four fifths (78.8%) of their lifetime without any activity limitation and the remaining 21.2% with severely limited or limited activity limitation. Two particular findings must be pointed out, when the regional dimension is taken into account. First, the differences in terms of life expectancy and of healthy life years do not move in the same direction. For instance, at NUTS_2 regions, the lowest level of life expectancy is found in Eastern Macedonia and Thrace (78.7) and the highest in Epirus (82.2). However, those regions are in a rather intermediate position in terms of healthy life years (63.4 and 65.3 years respectively) whereas Western Greece (57.5) and Ionian Islands (69.2) represent the two extremes. Second, life expectancy differentials are less pronounced than those in healthy life years. In fact, the maximum difference among regions in the expected number of life-years is 3.5 (4.5%) whereas in years without disability is 11.7 (20.4%).

Tables 4 and 5 show life and health expectancy for men and women, respectively. On the whole, the two particular findings, mentioned in the previous paragraph, also hold true for men and women. A boy born in Greece in 2009 would have a life expectancy of 77.8 years, and could expect to live on average 64.0 years (82.3%) without any activity limitation, 7.8 years (10.1%) with mild activity limitation and 5.9 years (7.6%) with severe activity limitation. Regional diversities are rather pronounced. The maximum difference in life expectancy among regions (NUTS_2 level) is about 3.1 years (Eastern Macedonia and Thrace vs. Epirus) while that in healthy life years is fourfold (12.5 years, Western Greece *vs.* Southern Aegean). A female baby born in Greece in 2009 could expect to live 82.6 years, where 62.4 years (75.5%) will be lived without disability, 12.2 years (14.7%) with some disability and 8.1 years (9.8%) with severe disability. Differences among regions in healthy life years are higher (11.9 years) than those in life expectancy (4.0 years). When gender dimension is combined with age, we observe that women of all ages live a greater number of years with limited or severely limited activity limitation, despite living longer. In fact, the gender gap in life expectancy decreases with age, while the differences in healthy life years remain rather constant (at around 3.0 years) between 20 and 59 years of age at the benefit of men and start decreasing at age 60 and over (Figure 1). This holds also at regional level with the only exception of three regions at NUTS_2 level (Eastern Macedonia and Thrace, Peloponnese and Epirus) and of one region at NUTS_1 level (Central Greece).

Table 2. Prevalence rates (weighted) without any activity limitation by sex and region, Greece, 2009.

	Total	Males	Females
	NUTS_1 level		
GR1- Northern Greece	74.6	80.1	70.1
GR2- Central Greece	75.7	79.3	73.0
GR3- Attica	80.5	84.8	75.3
GR4- Aegean Islands and Crete	75.9	80.5	70.7
	NUTS_2 level		
GR11- Eastern Macedonia and Thrace	74.7	79.0	71.3
GR12- Central Macedonia	73.4	77.0	70.2
GR13- Western Macedonia	73.6	*	67.3
GR14- Thessaly	78.2	88.0	70.4
GR21- Epirus	71.3	*	73.8
GR22- Ionian Islands	85.0	*	*
GR23- Western Greece	68.4	74.1	64.0
GR24- Central (Sterea) Greece	74.9	77.8	72.8
GR25- Peloponnese	83.2	86.1	81.3
GR41- Northern Aegean	73.3	*	*
GR42- Southern Aegean	81.2	85.4	77.4
GR43- Crete	74.4	80.5	66.4

Source: calculations based on the 2009 National Health Survey, Hellenic Statistical Authority (EL.STAT).
*Small sample size.

Discussion and Conclusions

Factors affecting gender and regional differentials in health expectancy

Our findings show that men are more likely to report good health than women, and the differences by gender are more pronounced at regional rather than national level. In particular, our results indicate

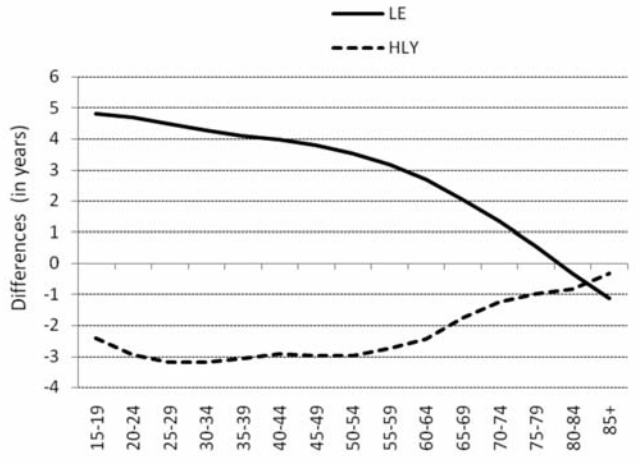

Figure 1. Differences (in years) in Life Expectancy (LE) and Healthy Life Years (HLY) between females and males by age group, Greece, 2009.

that, at regional level, there does not seem to exist a close relationship between the level of life expectancy and healthy life years at birth. For both sexes, health status does not appear to be reflected in the length of life expectancy. In other words, life expectancy does not necessarily reflect the health status of the population lived in the various regions of Greece. It is obvious that we need to identify better the underlying features associated with differences in health status between men and women at national as well as at regional level. Firstly, we have to consider that, if there is a (negative) relationship between age and good health, the fact that women live longer than men might be reflected in the longer period they live with functional limitations compared to men. At population level, this is appreciated through the differential ageing of female and male population. In order to estimate the impact of this demographic dimension on the differences in (weighted) prevalence rates without any activity limitation between men and women, we have calculated the corresponding standardized (weighted) prevalence rates for women. Those standardized rates are obtained by applying the prevalence rates of women to the age structure of the male population aged 15 years and over. The results indicate that, if the male and the female age distributions were identical, prevalence rates for women without disability could be 74.6% instead of 72.7%. Taking into account that, at national level, the prevalence rates without disability for men is 82%, we can conclude that around 21% of the difference between men and women as regards their health status, namely without any activity limitation, could be attributed to a pure demographic effect (*i.e.* to the fact that women live longer than men and therefore aging is more pronounced for the female rather than for male population). This demographic effect also holds for regional inequalities in health status, because of the unequal distribution of ageing across regions. However, according to our estimates only 10.5% of the difference across regions in prevalence rates without any activity limitation can be attributed to the demographic effect. The more limited impact of ageing in regional than in gender diversities is related to the fact that despite the more pronounced ageing across regions than between men and women, regional inequalities are higher than gender inequalities in terms of prevalence rates.

A second aspect that might be related to the magnitude of difference between men and women as well as across regions in terms of health status is migration. The argument is that gender diversities in health status in Greece both at national and regional levels are relatively high since these diversities are likely to be more pronounced within the (increasing) migrant rather than native-born population. However, this argument does not seem to hold true since, according to our estimations, the proportion of immigrants with disability is small and therefore a minor role of this variable in explaining the differences observed is expected.

The diversity in the way that the different subgroups tend to perceive their health status is the third aspect of differences in healthy expectancy across regions and between men and women. For gender issues in particular, it seems that women recall their symptoms more accurately, are more negative in their health assessments and report more health problems than men.[23-25] It is also argued that women tend to admit to having health problems, and to report them as more severe more often than men.[26] However, we do not underestimate other more *objective* factors. In fact, women remain in a disabled state for a longer period of time,[27] mainly because they have higher rates of disabling non-fatal chronic conditions, like arthritis and osteoporosis and higher co morbidity as well.[28] Differences, as compared to men, in muscle strength, body fat distribution and consequently obesity must also to be considered. It also seems that women's higher disability is related to their more inactive life style and lack of physical activity.

In particular for Greece, women are more likely than men to have

Table 3. Life expectancy (LE) and health expectancy (HE) at birth based on activity limitation by region, Greece, 2009. Both sexes.

	LE	HE				Health to life expectancy ratio			
		Severely limited		Limited		Not limited at all*		Not limited at all*	
		Years	(99% CI)	Years	(99% CI)	Years	(99% CI)	(%)	(99% CI)
GR-total	80.2	7.0	(6.6-7.4)	10.0	(9.5-10.5)	63.2	(62.7-63.7)	78.8	(78.3-79.3)
NUTS_1 level									
GR1	79.7	8.0	(7.3-8.7)	10.7	(9.8-11.6)	61.1	(60.2-62.0)	76.6	(75.7-77.5)
GR2	80.7	5.6	(4.9-6.3)	11.1	(10.1-12.1)	64.0	(62.9-65.1)	79.3	(78.2-80.4)
GR3	80.3	6.6	(5.9-7.3)	9.0	(8.2-9.8)	64.7	(63.8-65.6)	80.5	(79.6-81.4)
GR4	80.7	8.3	(7.1-9.5)	8.8	(7.4-10.2)	63.6	(62.0-65.2)	78.8	(77.2-80.4)
NUTS_2 level									
GR11	78.7	6.2	(4.7-7.7)	9.1	(7.3-10.9)	63.4	(61.3-65.5)	80.5	(78.4-82.6)
GR12	80.1	9.2	(8.2-10.2)	11.2	(10.0-12.4)	59.6	(58.3-60.9)	74.5	(73.2-75.8)
GR13	80.1	5.7	(3.6-7.8)	12.6	(9.4-15.8)	61.8	(58.6-65.0)	77.2	(74.0-80.4)
GR14	79.7	6.9	(5.5-8.3)	10.0	(8.1-11.9)	62.8	(60.9-64.7)	78.8	(76.9-80.7)
GR21	82.2	6.4	(4.6-8.2)	10.5	(8.1-12.9)	65.3	(62.5-68.1)	79.5	(76.7-82.3)
GR22	81.2	°	°			69.2	(66.4-72.0)	85.2	(82.4-88.0)
GR23	80.4	8.9	(7.3-10.5)	14.0	(11.8-16.2)	57.5	(55.3-59.7)	71.5	(69.3-73.7)
GR24	80.6	3.7	(2.4-5.0)	10.3	(8.3-12.3)	66.6	(64.5-68.7)	82.6	(80.5-84.7)
GR25	80.2	4.3	(3.2-5.4)	7.4	(5.8-9.0)	68.5	(66.8-70.2)	85.4	(83.7-87.1)
GR41	80.4	°	°	64.9	(61.9-67.9)	80.8	(77.8-83.8)		
GR42	80.8	°	°	66.5	(63.9-69.1)	82.4	(79.8-85.0)		
GR43	80.9	9.4	(7.7-11.1)	9.2	(7.3-11.1)	62.4	(60.2-64.6)	77.1	(74.9-79.3)

*Healthy Life Years (HLY); °Small sample size. Note: Sum of health expectancy may not add up to total life expectancy because of rounding. CI: Confidence interval. Source: Calculations based on the 2009 National Health Survey, Hellenic Statistical Authority (EL.STAT).

Table 4. Life expectancy (LE) and health expectancy (HE) at birth based on activity limitation by region, Greece, 2009. Males.

	LE	HE				Health to life expectancy ratio			
		Severely limited		Limited		Not limited at all*		Not limited at all*	
		Years	(99% CI)	Years	(99% CI)	Years	(99% CI)	(%)	(99% CI)
GR-total	77.8	5.9	(5.3-6.5)	7.8	(7.1-8.5)	64.0	(63.2-64.8)	82.3	(81.5-83.1)
NUTS_1 level									
GR1	77.4	6.6	(5.4-7.8)	8.3	(7.0-9.6)	62.5	(61.0-64.0)	80.7	(79.2-82.2)
GR2	78.3	°		°		63.3	(61.3-65.3)	80.9	(78.9-82.9)
GR3	78.0	5.6	(4.7-6.5)	6.9	(5.8-8.0)	65.5	(64.2-66.8)	84.0	(82.7-85.3)
GR4	78.4	°		°	64.5		(62.4-66.6)	82.3	(80.2-84.4)
NUTS_2 level									
GR11	76.1	°		°		62.8	(59.9-65.7)	82.5	(79.6-85.4)
GR12	77.8	8.7	(7.1-10.3)	8.6	(6.9-10.3)	60.5	(58.4-62.6)	77.8	(75.7-79.9)
GR13	78.0	°		°		°		°	
GR14	77.3	°		°		66.2	(63.0-69.4)	85.5	(82.3-88.7)
GR21	79.2	°		°		°		°	
GR22	79.2	°		°		°		°	
GR23	78.0	°		°		58.1	(54.3-61.9)	74.6	(70.8-78.4)
GR24	78.3	°		°		67.2	(64.6-69.8)	85.7	(83.1-88.3)
GR25	77.7	°		°		68.5	(66.3-70.7)	88.1	(85.9-90.3)
GR41	77.7	°		°		°		°	
GR42	78.9	°		°		70.6	(66.5-74.7)	89.5	(85.4-93.6)
GR43	78.5	°		°		62.8	(59.8-65.8)	80.0	(77.0-83.0)

*Healthy Life Years (HLY); °Small sample size. Note: Sum of health expectancy may not add up to total life expectancy because of rounding. CI: Confidence interval. Source: Calculations based on the 2009 National Health Survey, Hellenic Statistical Authority (EL.STAT).

Table 5. Life expectancy (LE) and health expectancy (HE) at birth based on activity limitation by region, Greece, 2009. Females.

	LE	HE				Health to life expectancy ratio			
		Severely limited		Limited		Not limited at all*		Not limited at all*	
		Years	(99% CI)	Years	(99% CI)	Years	(99% CI)	(%)	(99% CI)
GR-total	82.6	8.1	(7.6-8.6)	12.2	(11.6-12.8)	62.4	(61.7-63.1)	75.5	(74.8-76.2)
NUTS_1 level									
GR1	82.1	9.0	(8.1-9.9)	12.8	(11.7-13.9)	60.3	(59.2-61.4)	73.4	(72.3-74.5)
GR2	83.3	6.3	(5.4-7.2)	12.6	(11.3-13.9)	64.4	(63.0-65.8)	77.4	(76.0-78.8)
GR3	82.7	7.8	(6.8-8.8)	11.7	(10.6-12.8)	63.1	(61.9-64.3)	76.4	(75.2-77.6)
GR4	83.2	11.0	(9.2-12.8)	9.9	(7.9-11.9)	62.4	(60.2-64.6)	75.0	(72.8-77.2)
NUTS_2 level									
GR11	81.2	°		°		63.8	(60.9-66.7)	78.5	(75.6-81.4)
GR12	82.4	9.5	(8.2-10.8)	13.5	(12.0-15.0)	59.3	(57.9-60.7)	72.0	(70.6-73.4)
GR13	82.3	°		°		57.5	(53.4-61.6)	69.9	(65.8-74.0)
GR14	82.1	°		°		58.3	(55.3-61.3)	71.0	(68.0-74.0)
GR21	85.2	°		°		68.0	(64.6-71.4)	79.8	(76.4-83.2)
GR22	83.4	°		°		°		°	
GR23	83.0	°		°		56.8	(54.1-59.5)	68.5	(65.8-71.2)
GR24	83.1	°		°		66.7	(64.2-69.2)	80.4	(77.9-82.9)
GR25	82.8	°		°		68.7	(66.2-71.2)	83.1	(80.6-85.6)
GR41	83.2	°		°		°		°	
GR42	82.8	°		°		63.0	(59.1-66.9)	76.1	(72.2-80.0)
GR43	83.5	°		°		61.2	(57.6-64.8)	73.4	(69.8-77.0)

*Healthy Life Years (HLY), °Small sample size. CI: Confidence interval. Note: Sum of health expectancy may not add up to total life expectancy because of rounding. Source: Calculations based on the 2009 National Health Survey, Hellenic Statistical Authority (EL.STAT).

disabling, non-lethal conditions including functioning problems, IADL (Instrumental Activities of Daily Living) difficulties, arthritis and depressive symptoms whereas self-reported hypertension and obesity are generally more common among women than men.[29] In general, gender diversities in health status are mainly affected by the similarity in behaviours of men and women and women's poorer health status appear to be explained by differences in both diseases, and functioning and disability.[29-31]

Fourth, we also must keep in mind that gender differences in socio-economic characteristics such as educational level, participation in the labour market, income and occupation might be reflected in the diversity in terms of health status.[31] In Greece, men and women differ significantly in their working behaviour in terms of participation rates, activity sectors and occupations and at the same time the older generations of women have lower level of education compared to men.

Regional differentials in health expectancy are likely to be related to some additional factors. First, we cannot exclude possible selection bias introduced by the small sample size for a certain number of regions at NUTS_2 level. In fact, despite the high response rate of the participants in the survey, small sample size at NUTS_2 level may be a source of health status discrepancies among Greek regions.

Second, the inter-regional differences observed are likely to reflect the division between rural and urban regions or even the role of the degree of urbanization, referring to the place of residence, in health inequalities. Our data indicate that activity limitation is significantly lower for people living in densely-populated area (25.4%) than for those living in thinly-populated area (35.2%). Similar points are also raised by previous studies. In particular, Madianos *et al.*[32] point to the importance of the division between urban and rural areas for the diversities in mental health status. Other studies indicate how living in rural areas could be negatively related to population health status, because of the corresponding lifestyle factors[31] or of the individual characteristics such as been employed as farmers and been less educated and less wealthy.[30] Moreover, people leaving in rural areas, and in particular women, are less likely to adopt preventive behaviours and hence to improve their health status.[33] It is also worth noting that, the access to health services is unequally distributed by regions and that Greece presents very wide urban-rural disparities in terms of the use of medical care as compared to other OECD countries.[34]

Third, the inter-regional health inequalities in Greece are likely to be related to regional socio-economic diversities.[35] Several studies confirm the effect of regional socio-economic inequality on population health. This inequality is approximated by various aspects-indicators, namely the per capita GDP,[36] the level of industrial employment and per capita income,[37] the income inequality,[38] the regional socio-economic status[39] and the regional differences in terms of population growth, local infrastructure, economic-well being and economic productivity.[32] More recently, health inequalities at regional level were attributed to the regional inequalities in resource allocation and in the access to healthcare provision.[31] Undoubtedly, more research is needed towards the investigation of the role of the socio-economic diversities and the discrepancies in the access and use of health services in relation to the differences in population health status among regions and between genders.

Some strengths, weaknesses and limitations of our study

In this paper, healthy life years indicator was computed on the basis of activity limitation. The application of this particular health measure has both strengths and weaknesses.[40] In terms of strengths, the healthy life years indicator combines objective data (activity limitation, morbidity) and subjective data (self-perceived health). It is a useful benchmarking instrument as regards the health status between and within socio-economic groups and countries. In addition, since it can be measured for the major stages of a person's life, it might serve as relevant input for policies regarding labour participation, pensions and health conditions. As far as weaknesses are concerned, this indicator is partially based on self-rated health and therefore, its interpretation is not very clear. The risk of biased interpretation is related to the fact that self-perception of health is likely to be determined more by national and cultural values, norms, mental health and economic situation than by the health situation itself.[24] Moreover, it is not always obvious to distinguish differences between the healthy life years indicator and other health indicators based for instance on self-rated health or on disability.

Our approach has some limitations, even if some of them are not proper to our analysis. First, the methodologies for estimating health expectancies are not entirely satisfactory.[2] In particular, the Sullivan method which is used in our analysis is based upon the assumption that the observed cross-sectional age-specific proportions of healthy individuals are equal to the proportions of individuals at a given age who are healthy in a synthetic cohort. In fact the method produces an indicator which is affected by the history of mortality and disability, but this history is only partially reflected in the estimated prevalence rates. In order to resolve this bias, a multistate life table method may be used to estimate health expectancies by using transitional rates between health state.[8] However, this method requires data deriving from longitudinal survey, which are expensive and complex to carry out and thus not widely available. That is why research on health expectancies has more often relied on the Sullivan method which requires data from a cross-sectional census or survey, together with knowledge of overall mortality. There is no consensus in the literature about the extent of the bias in the Sullivan method and broadly, it seems that this method is the most-commonly used, more because of its reliance on widely available data than because of its reliability.[2] However, the bias that is introduced to the health expectancy estimates by the Sullivan method, is expected to be rather limited in our study, since we have focused our analysis on gender and regional diversities in a single year (2009) instead of over time variations in health status.

It is important to note that, Guillot and Yu proposed a new method for estimating health expectancies.[2] Their *intercensal* method uses age-specific proportions *healthy* at two successive, independent cross-sectional health surveys, and, together with information on general mortality, solves for the set of transition probabilities that produces the observed sequence of proportions healthy. Probably this is a way to follow in future research for Greece by using data from both the SILC (Survey on Income and Living Conditions) and the National Health Survey. Although application of that method, by using two successive surveys, will result in more appropriate measures of health expectancy, this can only partially resolve the second limitation of our study, and of other similar studies, which is related to the fact that we estimate *objective* results for health expectancy based on subjective views regarding people's health status.

Third, the institutionalized population was not taken into account in our calculations, since this information was not included in the definition of the survey population. However, this does not seem to have a significant impact on our results. In fact, simulations carried out by Eurostat based on ECHP data have shown that the effect of not including the institutionalized population in the computation of the healthy life years indicator at birth is very limited and not significant.[19] This was also the case for the analysis based on the data provided by the 2004 Belgian Health Interview Survey.[22] In particular for Greece, we need to consider that the institutionalized population is very small (according to the 2001 census data less than 3.5% of the total population) and that those people are very likely to spend only a marginal portion of their life-span in institutions, given the preference in Greece to

live with other family members. Consequently, there are strong reasons to believe that, even if the health status of people living in institutions might be different from that of people living in private households, the omission of those people might have a trivial impact on the average health status of the overall population.

Correspondence: Christos Bagavos, Department of Social Policy, Panteion University, 136, Syngrou Avenue, 17671 Athens, Greece.
Tel. +30.210.920.1733 - Fax: +30.210.9221222
E-mail: christosbagavos@gmail.com
Key words: health status, health expectancy, regional and gender differentials, Greece.
Conflict of interests: the authors declare no conflict of interests.
Acknowledgements: the author acknowledges the Hellenic Statistical Authority (EL.STAT.) for providing the data. Helpful comments from reviewers, editors, participants at the 17th European Colloquium on Quantitative and Theoretical Geography (ECQTG2011), organized by the Department of Geography of the Harokopion University of Athens, 2-6 September 2011, Cleon Tsimbos, Georgia Verropoulou and, in particular, Kate Michalopoulou are gratefully acknowledged.
Received for publication: 19 April 2013.
Accepted for publication: 30 July 2013.

Journal of Public Health Research 2013; 2:e12
doi:10.4081/jphr.2013.e12

References

1. Tsimbos C, Kotsifakis G, Verropoulou G, Kalogirou S. Life expectancy in Greece 1991-2007: regional variations and spatial clustering. J Maps 2011;280-90.
2. Guillot M, Yu Y. Estimating health expectancies from two cross-sectional surveys: the intercensal method. Demogr Res 2009;21:503-34.
3. Cambois E, Laborde C, Romieu I, Robine JM. Occupational inequalities in health expectancies in France in the early 2000s: unequal chances of reaching and living retirement in good health. Demogr Re 2011;25:407-36.
4. EHLEIS (European Health and Life Expectancy Information System). Bibliography on Health Expectancy in Europe, 2011. EHLEIS Technical Report 2011_4.3. 2011. Available from: http://www.eurohex.eu/pdf/Reports_2011/2011_TR4.3_Bibliography HE 2011.pdf.
5. Robine JM, Ritchie K. Healthy life expectancy: evaluation of global indicator of change in population health. Br Med J 1991;302:457-60.
6. Robine JM, Jagger C, Mathers CD, et al, eds. Determining health expectancies. Chichester: Wiley; 2003.
7. Sullivan DF. A single index of mortality and morbidity. HSMHA Health Rep 1971;86:347-54.
8. Rogers A, Rogers RG, Belanger A. Longer life but worse health? Measurement and dynamics. Gerontologist 1990;30:640-9.
9. Andreev EM, Shkolnikov VM, Begun AZ. Algorithm for decomposition of differences between aggregate demographic measures and its application to life expectancies, healthy life expectancies, parity-progression ratios and total fertility rates. Demogr Res 2002;7:499-522.
10. Lievre A, Brouard N, Heathcote C. The estimation of health expectancies from cross-longitudinal surveys. Mathem Popul Stud 2003;10:211-48.
11. Congdon P. A model for geographical variation in health and total life expectancy. Demogr Res 2006;14:157-78.
12. Eurostat. Statistics database. Population and social conditions-health. 2012. Available from: http://epp.eurostat.ec.europa.eu/portal/page/portal/statistics/search_database.
13. Bagavos C. [Health status of the population in Greece: life and health expectancy. 2012.] Labor Institute of the Greek General Confederation of Greece (INE/GSEE-ADEDY), Studies Series 20, Athens. [Article in Greek].
14. Tsimbos C. An assessment of socio-economic inequalities in health among elderly in Greece, Italy and Spain. Int J Publ Health 2010;55:5-15.
15. Mathers C, Sadana R, Salomon J, et al. Healthy life expectancy in 191 countries, 1999. World Health Report 2000. Lancet 2001;357:1685-91.
16. Jagger C, Gillies C, Moscone F, et al. Inequalities in healthy life years in the 25 countries of the European Union in 2005: a cross-national meta-regression analysis. Lancet 2008;372:2124-31.
17. EHEMU (European Health Expectancy Monitoring Unit). Health expectancy in Greece. Country Reports, Issue 5. 2012. Available from: http://www.eurohex.eu/pdf/CountryReports_Issue5/Greece_Issue 5.pdf.
18. Van Oyen H, Tafforeau J, Roelands M. Regional inequalities in health expectancy in Belgium. Soc Sci Med 1996;43:1673-78.
19. Eurostat. Statistics database. Health status indicators from the SILC survey (from 2004 onwards). 2012. Available from: http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=hlth_silc_06&lang=en.
20. EHLEIS (European Health and Life Expectancy Information System). Eurohex database and information system. 2012. Available from: http://www.eurohex.eu/IS/.
21. EL.STAT. (Hellenic Statistical Authority). National health survey 2009. 2011.
22. EHEMU (European Health Expectancy Monitoring Unit). Health expectancy calculation by the sullivan method: a practical guide, EHEMU Technical report 2006_3. 2007. Available from: http://www.eurohex.eu/pdf/Sullivan_guide_final_jun2007.pdf.
23. Sun WJ, Xu L, Chan WM, et al. Are depressive symptoms associated with cardiovascular mortality among older Chinese: a cohort study of 64,000 people in Hong Kong? Am J Geriatr Psychiatr 2013. [Epub ahead of print].
24. Yong V, Saito Y. Trends in healthy life expectancy in Japan: 1986-2004. Demogr Res 2009;20:467-94.
25. Case A, Paxson C. Sex differences in morbidity and mortality. Demography 2005;42:189-211.
26. Deeg DJH, Kriegsman DMW. Concepts of self-rated health: Specifying the gender difference in mortality risk. Gerontologist 2003;43:376-86.
27. Leveille SG, Penninx BW, Melzer D, et al. Sex differences in the prevalence of mobility disability in old age: the dynamics of incidence, recovery and mortality. J Gerontol B Psychol Sci Soc Sci 2000;55:S41-50.
28. Doblhammer G, Hoffmann R, Muth E, et al. A systematic literature review of studies analyzing the effects of sex, age, education, marital status, obesity, and smoking on health transitions. Demogr Res 2009;20:37-64.
29. Crimmins EM, Kim Jk, Solé-Auró A. Gender differences in health: results from SHARE, ELSA and HRS. Eur J Publ Health 2011;21:81-91.

30. Alexopoulos EC, Geitona M. Self-rated health: inequalities and potential determinants. Int J Environ Res Publ Health 2009;6:2456-69.
31. Darviri C, Fouka G, Gnardellis C, et al. Determinants of self-rated health in a representative sample of a rural population: a cross-sectional study in Greece. Int J Environ Res Publ Health 2012;9:943-54.
32. Madianos MG, Zacharakis C, Tsitsa C, Stefanis C. Geographical variation in mental hospital discharges in Greece and socio-economic correlates: a nationwide study (1978-1993). Soc Psychiatry Psychiatr Epidemiol 1999;34:477-83.
33. Papanikolaou V, Voskaki A. Health inequalities for women living in rural regions: the Prefecture of Xanthi, Greece. Health Care Women Int 2011;32:613-31.
34. Doorslaer VE, Masseria C. Income-related inequality in the use of medical care in 21 OECD countries, OECD Health Working Paper No 14, 2004. Available from: http://www.oecd-ilibrary.org/social-issues-migration-health/income-related-inequality-in-the-use-of-medical-care-in-21-oecd-countries_687501760705.
35. Economou A, Nikolaou A. Socio-economic inequalities in health. A review of the Greek Evidence. SPOUDAI 2005;55:74-88.
36. Tsimpos C, Roumeliotou A, Papaevangelou G. [Regional mortality differentials of the Greek population by causes of death: 1974-78]. Iatriki 1990;58:68-74. [Article in Greek].
37. Kyriopoulos J, Kalandidi A, Trichopoulos D. [Influence of socio-economic factors on cause specific mortality in Greece]. Materia Medica Greca 1983;11:192-6. [Article in Greek].
38. Le Grand J. Inequalities in health. Eur Econ Rev 1987;31:182-91.
39. Tountas Y. [Societal inequalities in health]. Arch Hellen Med 2000;17:351-4. [Article in Greek].
40. Oortwijn W, Mathijssen J, Lankhuizen M, Cave J. Evaluating the uptake of the healthy life years indicator. 2006. Report RAND Europe. Available from: http://ec.europa.eu/health/ph_information/indicators/docs/RAND_HLY_en.pdf.